

VIRology

Blood-borne hepatitis (parenterally transmitted hepatitis)

Blood- born hepatitis , Viral etiology

- Hepatitis B virus (HBV) , HCV,HDV ,and HGV . **All are enveloped** viruses

Hepatitis B virus, structure and classification

- Family : hepaDNAviridae.
- enveloped, with icosahedral nucleocapsid .
- It consists of an outer envelope containing hepatitis B surface antigen (HBsAg).
- And internal core (nucleocapsid) composed of hepatitis B core antigen (HBcAg).
- The viral genome is circular ds-DNA. **(MCQ)**
- has 8 genotypes (A – H).
- It contains DNA polymerase that has reverse transcriptase activity .

** The infected serum contains 3 types of hepatitis B particles:

- Large no. of free HBsAg particles .
- Some of these HBsAg particles are linked together to take the form of filaments
- the complete HBV-particle.



Hepatitis C virus

- Family : flaviviridae.
- Genus : hepacivirus.
- The virus is enveloped, ssRNA (+) can act as mRNA
- has six genotypes (1 – 6).

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Hepatitis D virus (D –defective)

- It is a defective virus, that cannot replicate by its own, It require a helper virus.
- The helper virus is HBV. **(MCQ)**
- HBV provides the free HBsAg particles to be used as an envelope **(MCQ)**.
- HDV is small.
- Composed of ss-RNA genome, surrounded by delta antigen that form the capsid

Hepatitis G virus (HGV)

- Share about 80% sequence homology with HCV. **(MCQ)**
- Family: flaviviridae.(like HCV)
- Enveloped, ss-RNA with positive polarity(+).
- Causes mild cases of acute and chronic hepatitis.
- Usually occurs as co-infection with HCV , HBV and HIV. **(MCQ)**

Transmission of hepatitis B & C

- 1- **Parenterally (percutaneously)** (لأمعوي) :
 - ❖ Direct exposure to infected blood.
 - ❖ Use of contaminated needles, syringes, dental and surgical instruments.
 - ❖ Use of contaminated instruments like scissors , nail clippers , tooth brush.
- 2- **Sexually:**
 - ❖ By having sexual contacts with infected person.
 - ❖ The viruses are present in semen and vaginal secretion.
 - ❖ The risk of sexual transmission increases , if one of the sexual partner has high viral load in the blood, HIV-infection, genital ulcers , vaginal/ rectal/ or urethral bleeding.
 - ❖ Unlike HBV, the risk of transmission of HCV through sexual contact is very low. **(MCQ)**
- 3- **From mother to child :**
 - ❖ Mostly perinatally, during labor , delivery or by direct exposure to the infected maternal blood.

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Hepatitis B markers very important (MCQ)

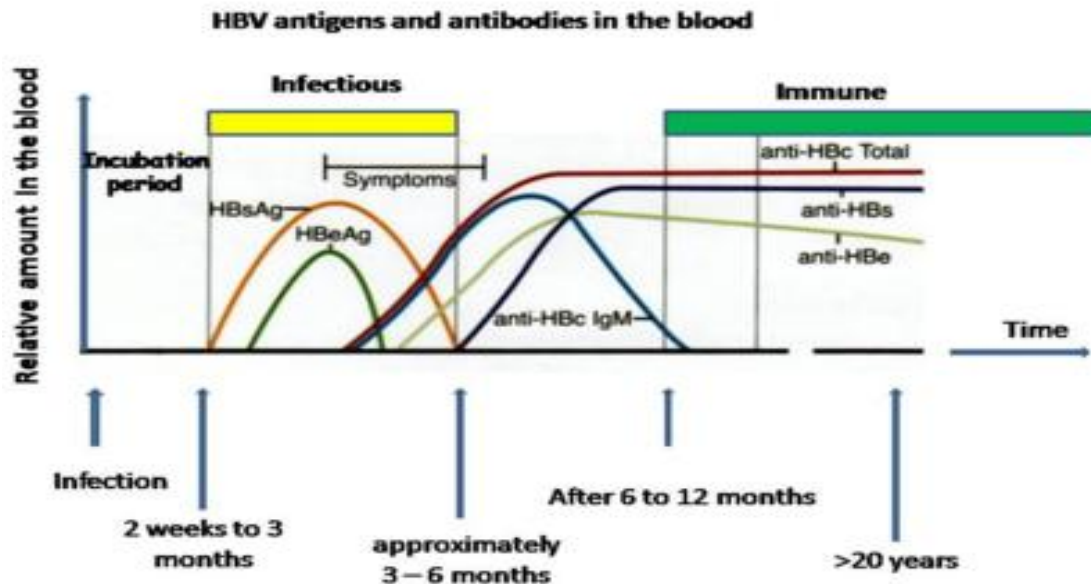
- 1-- Hepatitis B surface antigen (HBsAg):
 - ❖ Marker of infection.
- 2-- Hepatitis B e antigen (HBeAg) :
 - ❖ Marker of active virus replication, the patient is highly infectious, high viral load, the virus is present in all body fluids.
- 3-- Antibody to hepatitis B e antigen (Anti-HBe):
 - ❖ Marker of low infectivity, the patient is less infectious.
- 4-- Antibody to hepatitis B surface antigen (Anti-HBs):
 - ❖ Marker of immunity.
- 5-- Antibody to hepatitis B core IgG (Anti-HBc IgG)
 - ❖ It indicates previous exposure to hepatitis B infection.

Hepatitis C markers.

- 1– Hepatitis C virus – RNA .
 - ❖ the first marker that appears in circulation, it appears as early as 1W after infection .
- 2– IgG Antibody to hepatitis C.
 - ❖ Antibodies to hepatitis C virus usually appear 3- 12 weeks after infection.

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Serological profile of acute hepatitis B infection



- In acute infection , Hepatitis B surface antigen is the first marker that appears in the blood and persists for less than 6-months, then disappears. (MCQ)
- Hepatitis B e-antigen (HBeAg) is the second marker that appears in circulation and disappears before HBsAg .
- Antibody to the core (anti-HBc) is the first antibody that appears in the blood and usually persists for several years .
- with the disappearance of HBeAg, anti- HBe appears and usually persists for several weeks to several months .
- Antibodies to hepatitis B surface antigen (anti-HBs) is the last marker that appears in the blood.
- It appears few weeks after disappearance of HBsAg .
- Anti-HBs persists for several years , It indicates immunity to hepatitis B infection.
- Chronic hepatitis B infection is defined by the presence of HBV-DNA or HBsAg in the blood for more than 6-months . (MCQ)
- HBsAg may persists in the blood for life .
- After disappearance of HBsAg, anti-HBs appears and persists for several years .

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Types of hepatitis B infection(MCQ)

- 90 % of infected individuals will develop acute infection and recover completely.
- Less than 9 % of the infected individuals will progress to chronic hepatitis B.
- Less than 1 % will develop fulminant hepatitis B.

Types of hepatitis C infection(MCQ)

- About 20 % of the infected individuals will develop acute hepatitis C and recover completely.
- About 80 % of the infected will progress to chronic hepatitis C.
- Less than 1 % will develop fulminant hepatitis C , liver failure and death.

Types of hepatitis D infection

- 1-- Co-infection:
 - ❖ The patient is infected with HBV and HDV at the same time, **leading to severe acute** hepatitis .
 - ❖ Prognosis, recovery is usual.
- 2-- Super infection:
 - ❖ In this case, delta virus infects those who are already have chronic hepatitis B, **leading to severe chronic hepatitis**.

Acute viral hepatitis

- Most acute hepatitis B & C are asymptomatic or anicteric.
- When symptomatic, the initial symptoms are(Anicteric phase):
 - ❖ Low grade fever, anorexia, malaise, nausea, vomiting and right upper quadrant abdominal pain.
 - ❖ This is followed by the icteric phase, which is characterized by jaundice, dark urine and pale stool.
- The icteric phase is followed by the convalescent phase.
- Acute viral hepatitis usually lasts for several weeks.

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Prognosis

- Acute viral hepatitis varies from asymptomatic to fatal liver failure.
- Individuals with acute hepatitis B or C may become chronic carriers.
- In case of hepatitis B, 90 % of all acute cases will recover completely.
- In case of hepatitis C, about 20 % of all acute cases will recover completely.

Chronic viral hepatitis

- **Chronic hepatitis is limited to hepatitis B, C & D viruses.**
- The majority of patients with chronic hepatitis B and C are asymptomatic or mild fatigue only.
- Symptoms include, right upper quadrant abdominal pain, enlarged spleen, spider like blood vessels in the skin. Jaundice may or may not developed, fatigue.

Complications

- 1- **Cirrhosis (تليف الكبد) :**
 - ❖ is a chronic diffuse liver disease.
 - ❖ Characterized by fibrosis and nodular formation.
 - ❖ Results from liver cell necrosis and the collapse of hepatic lobules.
 - ❖ Symptoms includes, ascites, coagulopathy (bleeding disorder), portal hypertension, hepatic encephalopathy, vomiting blood, weakness, weight loss.
- 2- **Hepatocellular carcinoma (HCC) :**
 - ❖ One of the most common & deadly cancer in the world if not treated .
 - ❖ Symptoms include: abdominal pain, swelling, weight loss, anorexia, vomiting, jaundice.
 - ❖ Physical examination reveals hepatomegaly, splenomegaly and ascites.
 - ❖ without liver transplantation , the prognosis is poor and 1 year survival is rare.
 - ❖ Diagnosis: alpha-fetoprotein measurement with multiple CT(**Computed tomography**)-abdominal scan are the most sensitive method for diagnosis of HCC.
 - ❖ Treatment: surgical resection and liver transplant.

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Laboratory diagnosis of hepatitis B and C infections. (MCQ) مهم جداً

- 1-- **Hepatitis B infection** is diagnosed by **detection of HBsAg** in the blood.
- Positive results must be repeated in duplicate.
- Repeatedly reactive results must be confirmed by neutralization test .
- 2-- **Hepatitis C infection** is diagnosed by **detection of HCV-RNA** in the patient blood, using PCR (**polymerase chain reaction**).

Hepatitis B vaccine . (MCQ)

- it contains HBsAg particles , produced by genetic engineering in yeast.
- It is a recombinant and sub-unit vaccine .
- It is not live attenuated nor killed vaccin .
- The vaccine is administered in three doses , The vaccine is safe and protective .

Hepatitis C vaccine .

- there is no vaccine available to hepatitis C . (MCQ)

Treatment of hepatitis B infection.

- There are several approved anti-viral drugs.
- 1- pegylated alpha interferon, one injection per week, for 6- 12 months .
- 2- Lamivudine, anti-viral drug, nucleoside analogue. 1- tablet/day for at least 1 year
- 3- Adefovir, anti-viral drug, nucleoside analogue. 1- tablet/day for at least 1 year
- Treatment is limited to patients having chronic hepatitis B, based on liver biopsy.

Treatment of hepatitis C infection .

- The used treatment is the combined therapy, using pegylated alpha interferon and ribavirin .
- The dose: for pegylated interferon, 3 injections per week.
- For ribavirin, one tablet daily.
- Duration of treatment: 48-weeks.
- Treatment is limited to patients with chronic hepatitis C, based on liver biopsy.